



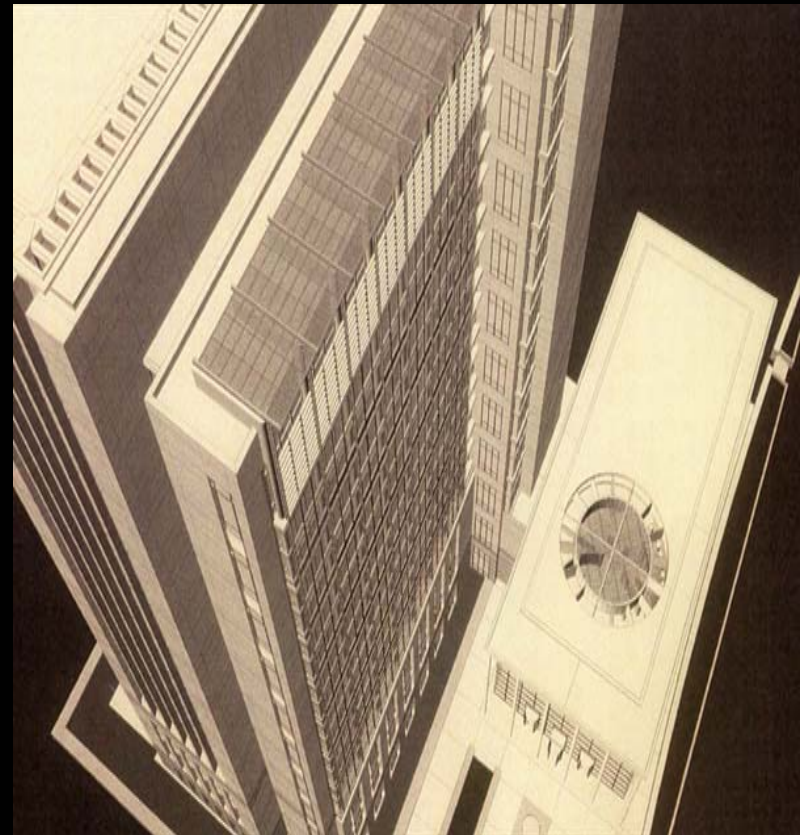
The Price Is Right!

What Being Sustainable Costs...

Interagency Sustainability Working Group

**Washington, DC
April 7, 2004**

David Eakin, PE
Chief Engineer
Office of the Chief Architect
Public Buildings Service

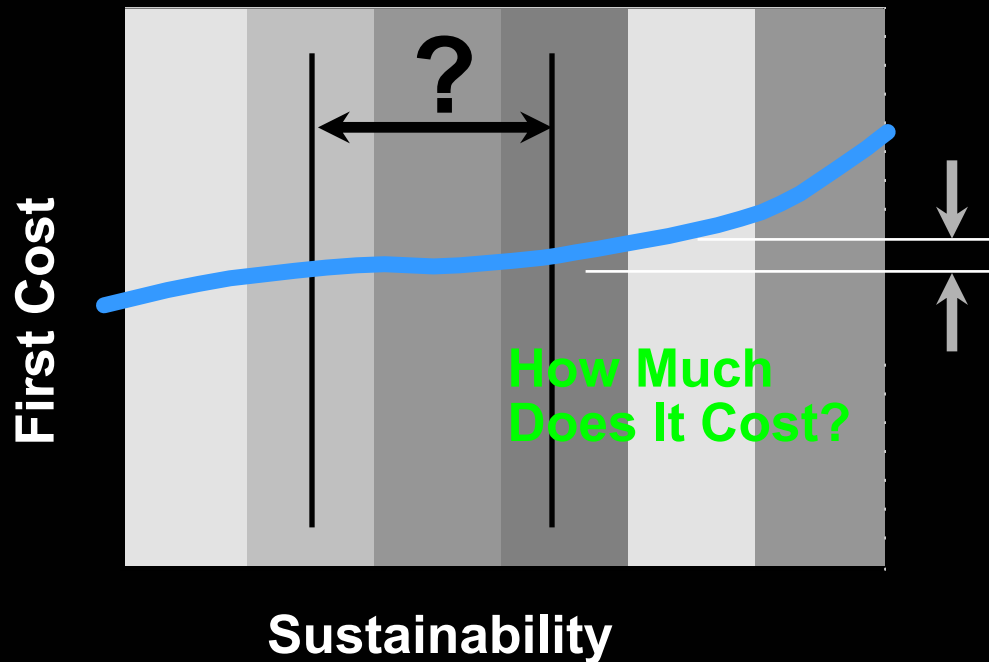


John Amatruda, RA
Elizabeth Heider, AIA

How **Green** Should We Be?

USGBC LEED Ratings

Certified, Silver, **Gold**, Platinum



Los Angeles Courthouse

Background

- **GSA's Current Sustainability Requirements**
 - LEED Certified Rating at Minimum
 - Strive for LEED Silver
- **Previous Green Cost Assumptions:**
 - 2.5% cost increase (assumed Silver)
 - Based on 1998 GSA Study
 - Not specific to LEED





LEED Cost Study Scope

- **Define Costs for Individual LEED 2.1 Credits**
 - Costs = Projected Costs - GSA Baseline
 - Costs Related to Washington, DC - Sept. 2003
- **Define Costs for 12 LEED “Scenarios”**
 - 6 for a New Courthouse (2 Certified, 2 Silver, 2 Gold)
 - 6 for an Office Building Modernization
- **Define Soft Cost Impacts**
 - Design Costs and
 - LEED Documentation Costs
- **Develop LEED Applications Guide**

Comprehensive Perspective

Sustainability Principles...

- 1 **Site and Transportation**
(Local Ecosystem, Public Transit)
- 2 **Energy Efficiency**
(HVAC, Lighting, Envelope, BAS)
- 3 **Water Usage**
(Quantity, Purity)
- 4 **Materials/Systems**
(Recycling, Contaminants, Durability, Locally Available)
- 5 **Indoor Environment**
(IAQ, Acoustics, Odors)
- 6 **Facility Operations**
(O&M Replacements, Diagnostics, Flexibility, Access, Cleanability)
- 7 **Construction**
(Packaging, Site Waste Mgt., Quality Assurance Testing and Start-up)



San Francisco Federal Building

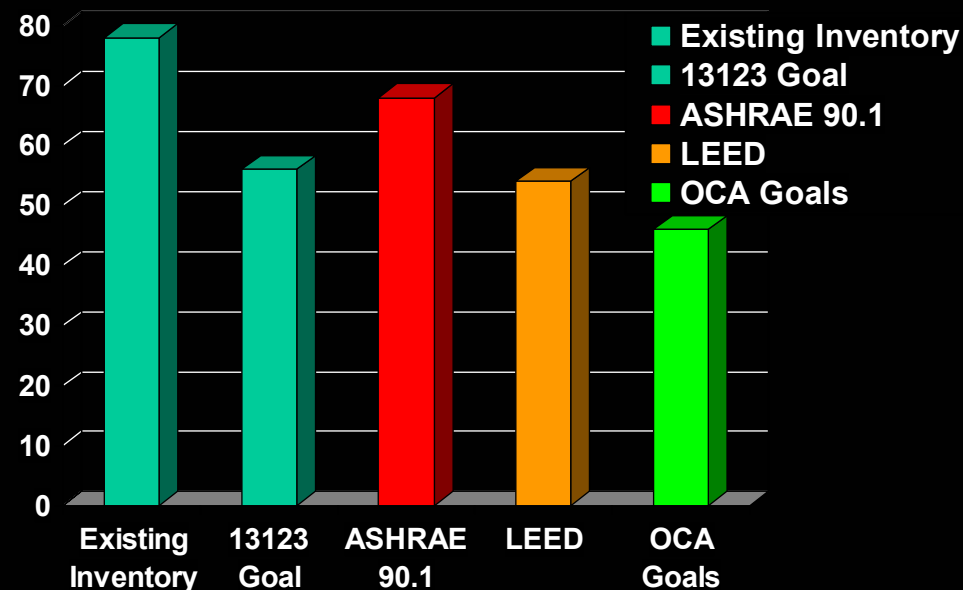




Energy Efficiency Perspective

Energy Goal Criteria

- **ASHRAE 90.1-1999**
(CFR 435/434 Equivalent)
- **EO 13123, 35% Reduction**
(= 55,000 BTU/GSF/Yr.)
- **Energy Star Compliant**
(Actual Use Within Top 25%)
- **LEED “Silver”**
(Beat ASHRAE 90.1 for Credits)
- **Project Energy Goals**
($< 45,000$ BTU/GSF, 140 kWh/M²)



Of these...

- **GSA Energy Goals and LEED Impacts are Most Demanding**



Study Approach

Selecting LEED Credits

LEED Scenarios: New Courthouse (partial)

ID#	LEED Prerequisite or Credit	Rating:	NEW COURTHOUSE					
			Certified		Silver		Gold	
		Case #:	1A Low	2A High	3A Low	4A High	5A Low	6A High
SS	SUSTAINABLE SITES							
SS-P1	Erosion and Sedimentation Control		PRE.	PRE.	PRE.	PRE.	PRE.	PRE.
SS-1	Site Selection		1		1		1	
SS-2	Development Density		1		1		1	
SS-3	Brownfield Redevelopment		1		1		1	
SS-4.1	Alternative Transportation- Public Transportation Access		1	1	1	1	1	1
SS-4.2	Alternative Transportation- Bike Storage & Changing Rooms							1
SS-4.3	Alternative Transportation- Alternative Fuel Vehicles							
SS-4.4	Alternative Transportation- Parking Capacity / Carpooling							
SS-5.1	Reduced Site Disturbance- Protect / Restore Open Space		1		1		1	
SS-5.2	Reduced Site Disturbance- Development Footprint		1		1		1	
SS-6.1	Stormwater Management- Rate and Quantity		1		1		1	1
SS-6.2	Stormwater Management- Treatment							1
SS-7.1	Landscape and Exterior Design to Reduce Heat Islands- Non-roof		1	1	1	1	1	1
SS-7.2	Landscape and Exterior Design to Reduce Heat Islands- Roof		1	1	1	1	1	1
SS-8	Light Pollution Reduction		1		1		1	
	SS Totals (14 Possible Points)		10	3	10	3	10	6



Construction Cost Impacts

New Courthouse

	Certified		Silver		Gold	
	1A	2A	3A	4A	5A	6A
\$/GSF	(\$0.81)	\$2.32	(\$0.10)	\$8.96	\$2.47	\$17.19
% Change	-0.4%	1.1%	-0.1%	4.1%	1.1%	7.9%

Office Building Modernization

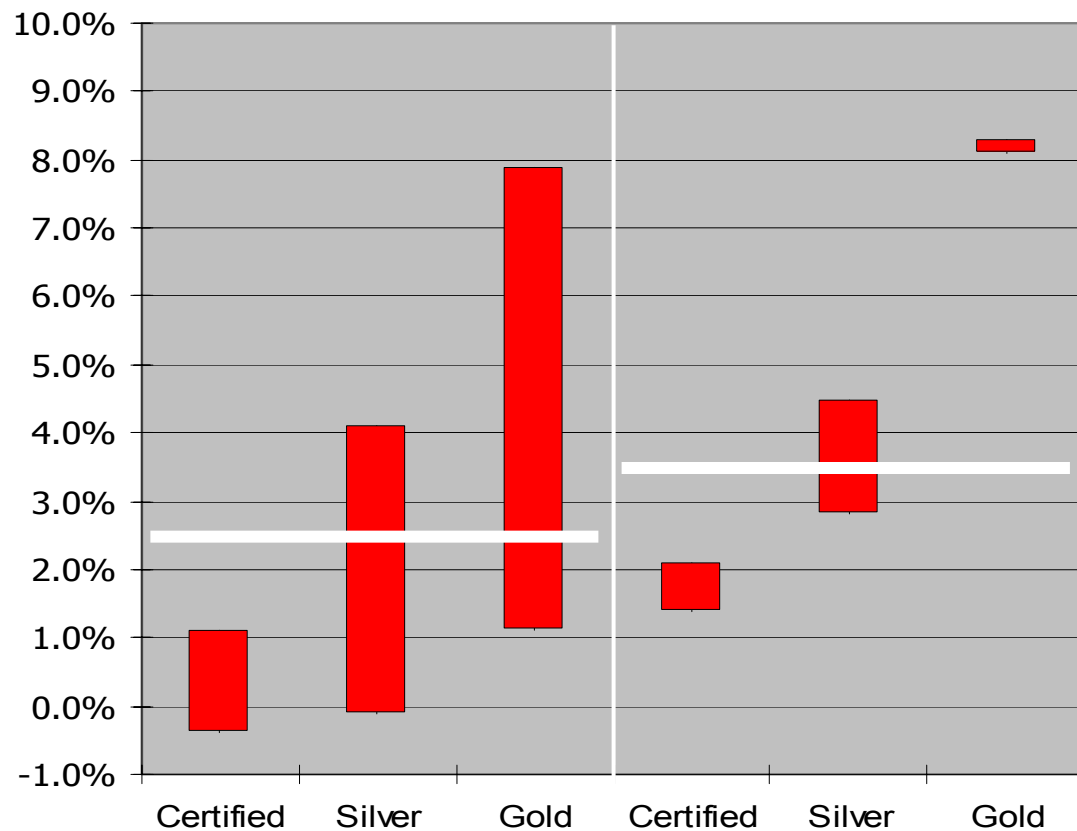
	Certified		Silver		Gold	
	1B	2B	3B	4B	5B	6B
\$/GSF	\$1.79	\$2.73	\$3.60	\$5.97	\$10.65	\$10.65
% Change	1.4%	2.1%	2.8%	4.5%	8.3%	8.1%



Construction Cost Perspective

**Design
Contingency**

**Estimating
Accuracy**



Courthouse

Office Building

Sustainability Cost Context

Integrated Performance Initiatives

■ Sustainability

(Environmental Design-
Being “Green”)

■ Workplace Productivity

(Space Equity, Comfort, Flexibility,
Reliability, Sense of Place, etc.)

■ Terrorism

(Levels of Threat: Blast, Small
Arms, Air-Born, Theft/Assault)

■ Seismic Safety

(New FEMA Requirements)

■ Historic Preservation

(Historic Districts, Building
Element Preservation/Restoration)

Systems		Aesthetics	Productivity	Sustainability	Security	Seismic	Fire Safety	Accessibility	Historic Pres.	Oper. & Main.
Foundations										
Basement Construction				2	2	3				
Superstructure		2		2	3	3	2	2	2	
Exterior Walls		3	2	3	3	3	2		3	2
Exterior Glazing/Doors	Windows	3	2	3	3	2	2		2	3
	Doors	2	2	2	3	2	2	3	2	2
	Special, Atria	3	2	2	3	2	3		2	3
Roofing	Coverings	2		3	2		3		2	3
	Skylights	3	2	3	2	2	2		2	3
Interior Partitions/Doors		3	2	2	3	2	3	3	3	2
Interior Access Floors			3		2	2	2			2
Interior Finishes	Wall Finishes	3	3	2			2		3	2
	Floor Coverings	3	3	3			2		3	3
	Ceiling Treatments	3	3	3	2	2	2		3	3
Conveyance Systems		3	2		2	2	2	3		3
Plumbing	Fixtures	2		3				3		2
	Dist. And Drainage			2		2		2		2
HVAC	Central Plant		3	3	2					3
	Air Distribution	2	3	3	3		3		3	3
Fire Protection					2	3	3	2	2	2
Service & Distribution	Main Power		2		2	3	2			2
	Emergency Power		3	2	3	3	3			
Light'g & Branch Wiring		3	3	3	3	2			3	3
Communications & Security			2		3		2			2
Equip. & Furnishings	Oper. & Maint.		3	2				2		3
	Food Services	2	2				2	2		2
	Fixed Furnishings	3	2	2			2	3	3	2
Special Building Const.		2	2	2		2	2			2
Demolition & Abatement	Bldg Elements			3					3	
	Hazard Mat.			3						
Sitework - Building Related	Site Prep.			3					2	
	Landscaping	3	2	3	2			2	2	3
	Utilities				2	3	2			2
Other Sitework - Project Related		3	2		2	2	2	3	2	2

What's In the Soft Costs?

- Facilitate LEED Charrette
- Point of Contact
- Technology Advisor
- Develop LEED Action Items
- Materials/Systems Research
- LEED Calculations for IEQ Credits
- Energy Calculations
- LEED Credit Interpretations
- Specification Edits
- Coordinate LEED Submittals With CM
- Review Contrator Submittals
- Assemble LEED Documentation



Design Team Fees

(With LEED Consultant)

New Courthouse **x \$1,000**

Certified		Silver		Gold	
1A	2A	3A	4A	5A	6A

Design Fee Premium

\$83.8	\$97.7	\$83.8	\$120.1	\$134.0	\$182.5
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LEED Documentation & Certification

\$22.4	\$22.4	\$23.6	\$23.6	\$26.0	\$26.0
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Soft Cost Totals

\$106.1	\$120.1	\$107.5	\$144.6	\$159.9	\$208.5
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Cost Impact (\$/GSF)

\$0.41	\$0.46	\$0.41	\$0.55	\$0.61	\$0.80
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Office Modernization

Certified		Silver		Gold	
1A	2A	3A	4A	5A	6A

Design Fee Premium

\$97.7	\$99.9	\$107.4	\$123.2	\$184.3	\$181.0
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LEED Documentation & Certification

\$26.7	\$26.7	\$28.0	\$28.0	\$30.3	\$30.3
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Soft Cost Totals

\$124.4	\$126.6	\$135.4	\$151.2	\$214.6	\$211.3
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Cost Impact (\$/GSF)

\$0.41	\$0.41	\$0.44	\$0.49	\$0.70	\$0.69
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Experienced Design Team Fees

(w/o Using LEED Consultant)

New Courthouse

x \$1,000

	Certified		Silver		Gold	
	1A	2A	3A	4A	5A	6A
Design Fee Premium	\$88.1	\$93.3	\$88.1	\$116.5	\$116.5	\$160.5
LEED Documentation & Certification	\$24.3	\$24.3	\$26.0	\$26.0	\$29.5	\$29.5
Soft Cost Totals	\$112.4	\$117.6	\$114.1	\$142.5	\$146.0	\$190.0
Cost Impact (\$/GSF)	\$0.43	\$0.45	\$0.44	\$0.54	\$0.56	\$0.73

Office Modernization

	Certified		Silver		Gold	
	1A	2A	3A	4A	5A	6A
Design Fee Premium	\$78.0	\$78.0	\$87.7	\$11.2	\$147.0	\$141.5
LEED Documentation & Certification	\$28.7	\$28.7	\$30.4	\$30.4	\$33.9	\$33.9
Soft Cost Totals	\$106.7	\$106.7	\$118.1	\$41.6	\$180.9	\$175.4
Cost Impact (\$/GSF)	\$0.35	\$0.35	\$0.38	\$0.43	\$0.59	\$0.57



Copies Available Soon

Whole Building Design Guide

...Study findings along with an applications guide will be posted on the WBDG in the Spring 2004.

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Design Guidance

Project Management

Manuals / References

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Welcome to the Whole Building Design Guide

A Building Professional's
Gateway to Up-to-Date
Information on Integrated,
'Whole Building' Design
Techniques and Technologies



WBDG Focus On

SECURITY

Browse through these and other pages to find out more about how security affects the overall function of a building and its design.

Design Objectives:
Secure/Safe

- Provide Security for Building Occupants and Assets
- Balancing Security/Safety & Sustainability Objectives

The "Whole Building" Design Approach

The goal of 'Whole Building' Design is to create a successful high-performance building. To achieve that goal, we must apply the integrated design approach to the project during the planning and programming phases. It is necessary for the people involved in the building design to interact closely throughout the design process. The owner, building occupants, and operation and maintenance personnel should be involved to capture their understanding of how the building and its systems will work for them once they occupy it. The fundamental challenge of 'whole buildings' design is to understand that all building systems are interdependent. [More](#)

Participating Agencies:



www.wbdg.org



The “Legacy” Construction Program

